REMARKS/ARGUMENTS

Claims 57-63 and 65-75 remain pending in this application. Claims 57-58 and 60-63 stand rejected. Claims 57, 59 and 61-63 are amended. Claim 57 is amended to include the limitations of claim 64 and to clarify the claim's language. For example claim 57 now recites, in part, ".....applying a first voltage to a drive electrode that electrostatically drives the MEMS structure....integrating the first current to generate a first difference voltage by which the first voltage is changed thereby to generate a second voltage..... integrating the second current to generate a second difference voltage by which the second voltage is changed thereby to generate a third voltage ....." Claim 59 is amended to include the limitations of unamended claim 57 and claim 58 and is thus allowable, per Examiner's statement on page 4 of the Office Action. Claims 65-75 are allowed. In view of the foregoing amendments and following remarks, reconsideration of the rejections of claims 57-58 and 60-63 is respectfully requested.

Claim Rejections under 35 U.S.C. 103(a)

Claims 57-58 and 6-63 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Garverick et al. (U.S. 2002/01011769 A1). In rejecting claim 57, the Examiner asserts:

"Garverick et al. discloses a method for operating a driver circuit electrostatically driving a MEMS structure, comprising: a first and second voltage which can be coupled to a drive electrode that electrostatically drives the MEMS structure (section 0015 and 0016) but does not specifically state generating a first output current in response to a first digital control word and integrating the first output current to increase or decrease a first voltage by an amount and in a direction controlled by the first digital control word. It is obvious to generate a first output current, which is the output, in response to a first digital control word, which is the input, and integrating the first output current to increase or decrease a first voltage by an amount and in a direction controlled by the first digital control word this being reasonably based upon it is well known in the art of digital controllers."

Applicant respectfully traverses this rejection for at least the following reasons. As pointed out correctly by the Examiner, Garverick et al. (hereinafter Garverick) fails to disclose, for example, "integrating the first current" to change a first voltage, as recited, in part, in claim 57. In contrast, Garverick, as best understood, uses pulse-width modulation (PWM) to control the applied voltages to control the mirror positions:

"Pulse-width modulation (PWM) drive circuitry particularly applicable to an array of electrostatic actuators formed in a micro electromechanical system (MEMS), such as used for optical switching" (Abstract)

"The invention includes the method and circuitry for driving an electrostatic or other type of actuator, particularly that used for a micro electromechanical system (MEMS). In an electrostatic actuator, a variable gap capacitor is formed between electrodes fixed on two mechanical elements, one of which is movable with respect to the other against a restoring force, such as a spring. The relative position of the two elements is controlled by pulse width modulation (PWM) in which the pulse width of a repetitive drive signal determines the RMS value of the applied voltage. The frequency of the drive signal is preferably at least ten times the mechanical resonant frequency of the mechanical elements." (0015)

"The described PWM control offers several advantages. The voltage seen across the electrodes is the difference between the square wave common node signal and its phase shifted counterparts. Thereby, a high-voltage power supply of V_H produces voltage swings of $2.V_H$ and a bipolar signal having a maximum root mean square (RMS) value of V_H and a zero DC component. The high-voltage common node signal V_C may be supplied to all the common nodes of the array and may be supplied by a single off-chip driver, thus reducing the needed die size. Further, the applied RMS voltage, which determines the mirror position or tilt, varies linearly with the pulse width of the differential signal or the delay between the two digital drive signals. Such linearity may simplify the actuator control." (0052)

Because Garverick teaches pulse-width modulation (PWM) to control the voltages in order to determine the mirror position, Garverick teaches away from "integrating the first current" to control the voltage changes as a way of changing mirror positions. Therefore, no motivation exists to combine the technique of using pulse-width modulation to effect a voltage change, as disclosed by Garverick, with the technique of using current integration to effect a voltage change, as recited in amended claim 57. Therefore, contrary to the Examiner's assertions, it would not have been obvious in Garverick to generate a first current, and integrate the first current to change the first voltage. Garvercik thus fails to render amended claim 57 unpatentable under 35 U.S.C. 103(a).

Claim 57 further distinguishes from Garverick for at least the following additional reason. As best understood, in Garverick, the mirror position data--which correspond to applied voltages--appear to be stored in the addressed cells. In other words, in Garverick, the cells appear to store mirror positions so as to enable movement to the next positions, as described in paragraph (0048) of Garverick and reproduced below:

"The microprocessor 150 controls a time multiplexed storage of position control in the actuator array ASIC 144. In the pulse width modulation control, the position control is dictated by a multi-bit duty cycle. The position data and a row and column address for which the data is to be applied are delivered to the actuator array 144 by the microprocessor 150. A write enable signal WE causes the addressed cell of the actuator array 144 to store the position data. Thereby, all cells are sequentially stored with position data, and the position data of any one cell can be updated as desired. A compare enable signal CE from microprocessor causes all of the cells in the actuator array to be simultaneously PWM controlled according to position data stored in the respective cell with a timing referenced to a clock signal CLK supplied from the microprocessor 150 as derived from an oscillator 152. In the described example, the electrostatic microactuators are subjected to a bipolar signal oscillating at 50 kHz and the CLK signal is 512 times greater, that is, 25.6 MHz." (0048)

Therefore, because in Garverick the mirror position data appear to be stored in the addressed cells, the applied voltages--which correspond to these position--are not referenced with respect to one another. In other words, in Garverick, a voltage associated with one mirror position is not determined in reference to the voltage associated with a previous mirror position and, therefore, Garverick fail to generate, for example, first and second difference voltages in order to, respectively, generate second and third voltages, as recited in claim 57. In contrast, claim 57 recites, in part "....generate a first difference voltage by which the first voltage is changed thereby to generate a second voltage.... generate a second difference voltage by which the second voltage is changed thereby to generate a third voltage....", which as described above, Garverick fails to teach or suggest. Claim 57 is allowable over Garverick for this additional reason. Claim 57 is thus allowable over Garverick under 35 U.S.C. 103(a) for at least the reasons cited above. Claims 58 and 60-63 are dependent on claim 57 and are thus allowable for at least the same reasons as is claim 57.

Allowable Subject Matter

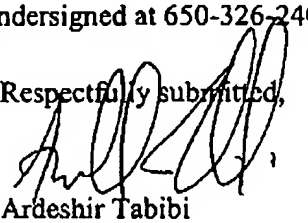
Claim 59 is rewritten above to include the limitations of claims 57 and 58 and is thus allowable in accordance with the Examiner's statements on page 4 of the Office Action.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application, namely claims 57-63, and 65-75 are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, the Examiner is invited to call the undersigned at 650-326-2400.

Respectfully submitted,



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